Tracing the costs of local opposition to energy infrastructure: Empirical insights from the case of wind energy

Magdalena Klemun, Tongyao Zhang

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Magdalena M. Klemun
Assistant Professor, Division of Public Policy and Energy Institute
The Hong Kong University of Science and Technology
(magdalena@ust.hk)

香港科技大學
THE HONG KONG
UNIVERSITY OF SCIENCE
AND TECHNOLOGY

Opposition to new wind energy projects is a global phenomenon

https://www.gazettelive.co.uk/news/teesside-news/protestors-joy-plans-140m-high-11390862

Opposition to new wind energy projects is a global phenomenon

Somerset (NY), USA

Wilton Village, UK

Stanley, Australia

https://www.denverpost.com/2016/11/27/new-york-towns-fight-wind-turbines/
https://www.gazettelive.co.uk/news/teesside-news/protestors-joy-plans-140m-high-11390862
https://www.abc.net.au/news/2021-06-24/epuron-wind-farm-proposal-splits-stanley-residents/100239492

Opposition to new wind energy projects is a *lasting* phenomenon

The Economist, 2004

Menu

Britain | Wind power

Tilting at windmills

Wind power was expected to flourish offshore. So why is it mostly onshore?

Mar 18th 2004 | GREAT GLEMHAM, SUFFOLK

THE hedgerows of Great Glemham, a small village in Suffolk, make an unusual billboard for political posters. Currently they feature eye-catching protests against plans for a wind farm on a disused airfield in next-door Parham. When the project was announced in December, residents mostly welcomed the idea. Many have now changed their mind and relations with the farmer who owns the site, an upstanding member of the Parish Council, have become strained. In the middle of one Saturday night, someone snuck around taking all the posters down.

The Cambrian, 2023

Protests about pylons and wind turbines in West Wales

Letter to the Editor

24th April 2023

edit@cambrian-news.co.uk

SHARE

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Local opposition to wind energy projects comes at a cost

- Legal fees
- Consulting fees
- Payments into community benefit funds
- Payments into wildlife conservation funds
- Administrative costs
- Costs associated with project delays

Previous work: Sources of opposition and associated delays, but limited focus on costs

- Concerns about **land values, environmental impacts** are the most common sources of opposition (Susskind et al., 2022)
- Low-carbon power is **as conflictive as fossil-fired power plants** (Temper et al., 2020)
- Protests lead to **cancellations, suspensions, and delays** (Temper et al., 2020)
- Proximity to wind power can **reduce house prices and property values** by up to 5% (Droes et al. 2021, Jarvis 2021)

Research questions

- What approaches have emerged in different wind energy markets to address local opposition to new projects?
- How much do these measures add to upfront investment costs?

Method and data

- *Metrics*:

  Opposition cost as a share (p_{opp}) of upfront investment cost* (C_{CapEx}), summing over the discounted value of *i* types of opposition costs

$$p_{opp} = \frac{100\ C_{opp}}{C_{CapEx} + C_{opp}}$$

$$C_{opp} = \sum_{i} c_{opp,i}$$

*Focus on upfront investment rather than LCOE to separate C_{opp} from effects of capacity factors

- *Data and sample size:*
  - 480 projects overall, covering approx. 60% of installed capacity in 2022 in UK and Australia, 45% in Denmark, 6% in the US, 2% in Canada
  - All countries: CapEx from developer website, supplemented country-averages from IRENA
  - UK: Scottish government's community and renewable energy scheme administrator, developer/operator/owner websites for England and Wales
  - UK wind farm planning durations: Renewable Energy Planning database Denmark: Online data repository of the Danish renewable energy co-ownership scheme (Koeberetsordningen)
  - US, Canada from news media articles, developer websites

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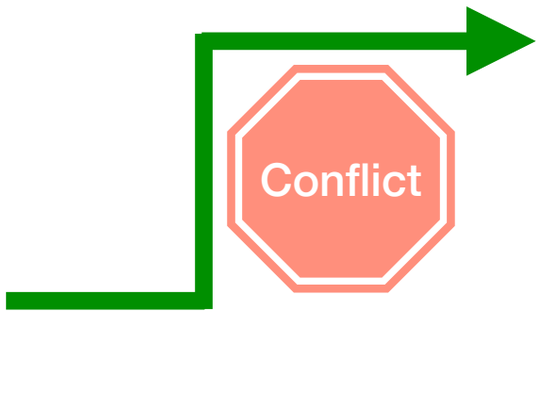
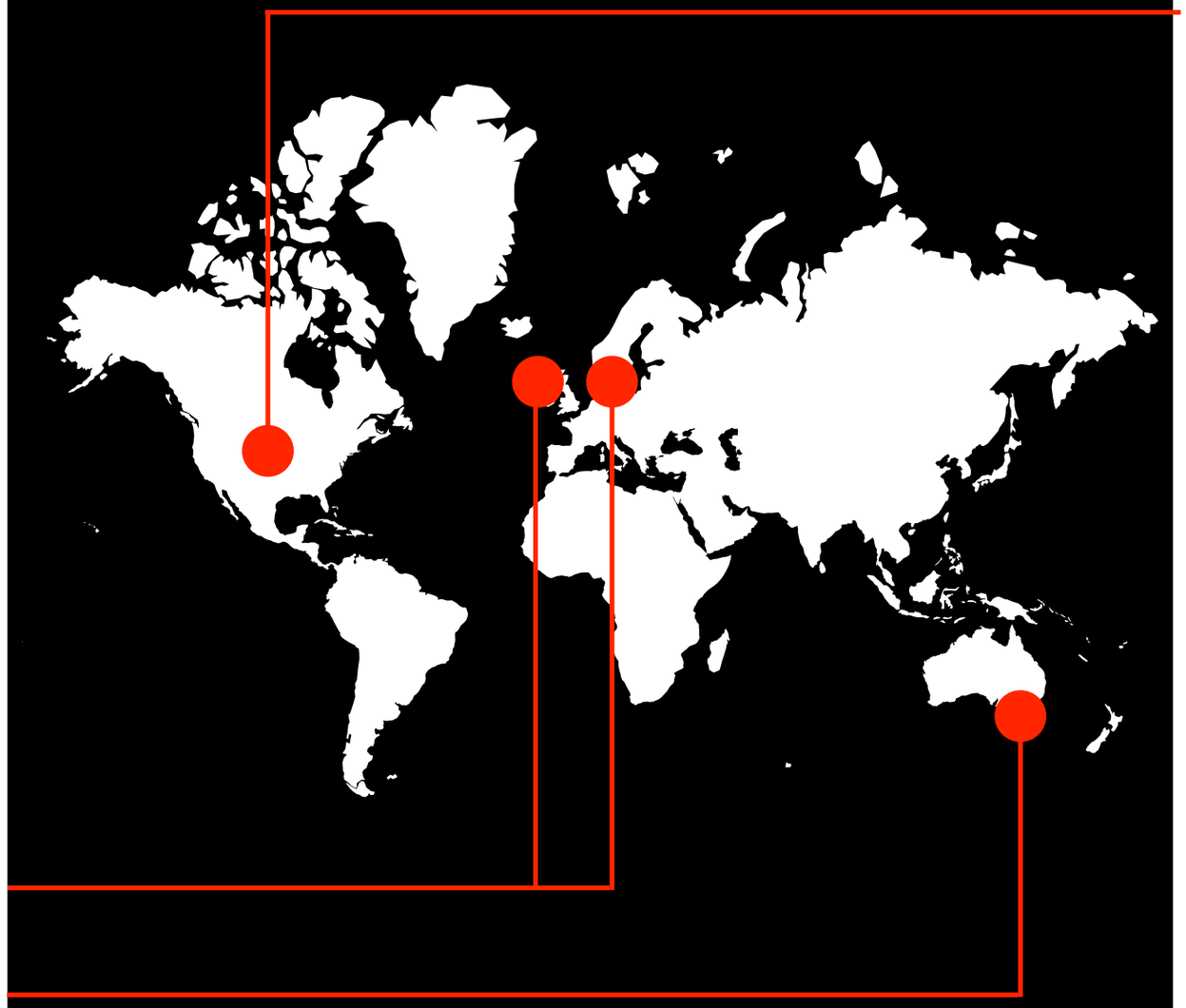
Two main approaches: Proactive and reactive

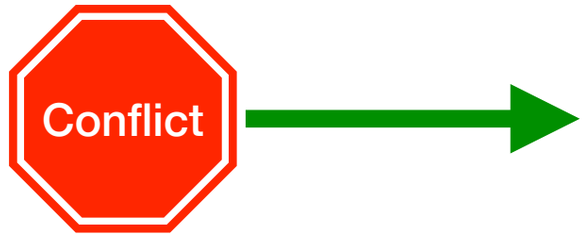
PROACTIVE



Deliberate, premeditated management of opposition to new energy projects



REACTIVE

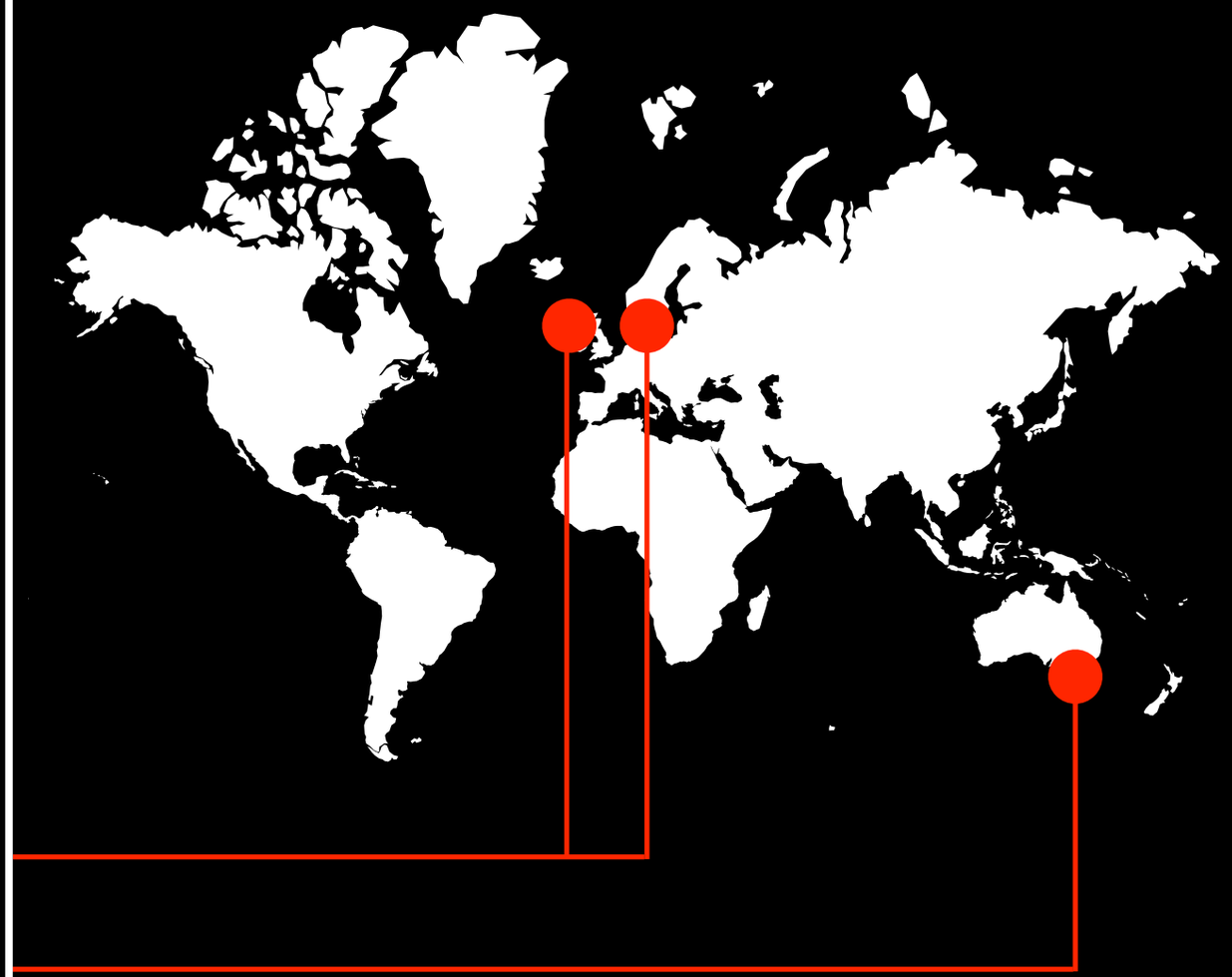


Ad-hoc, case-by-case management of opposition to new energy projects

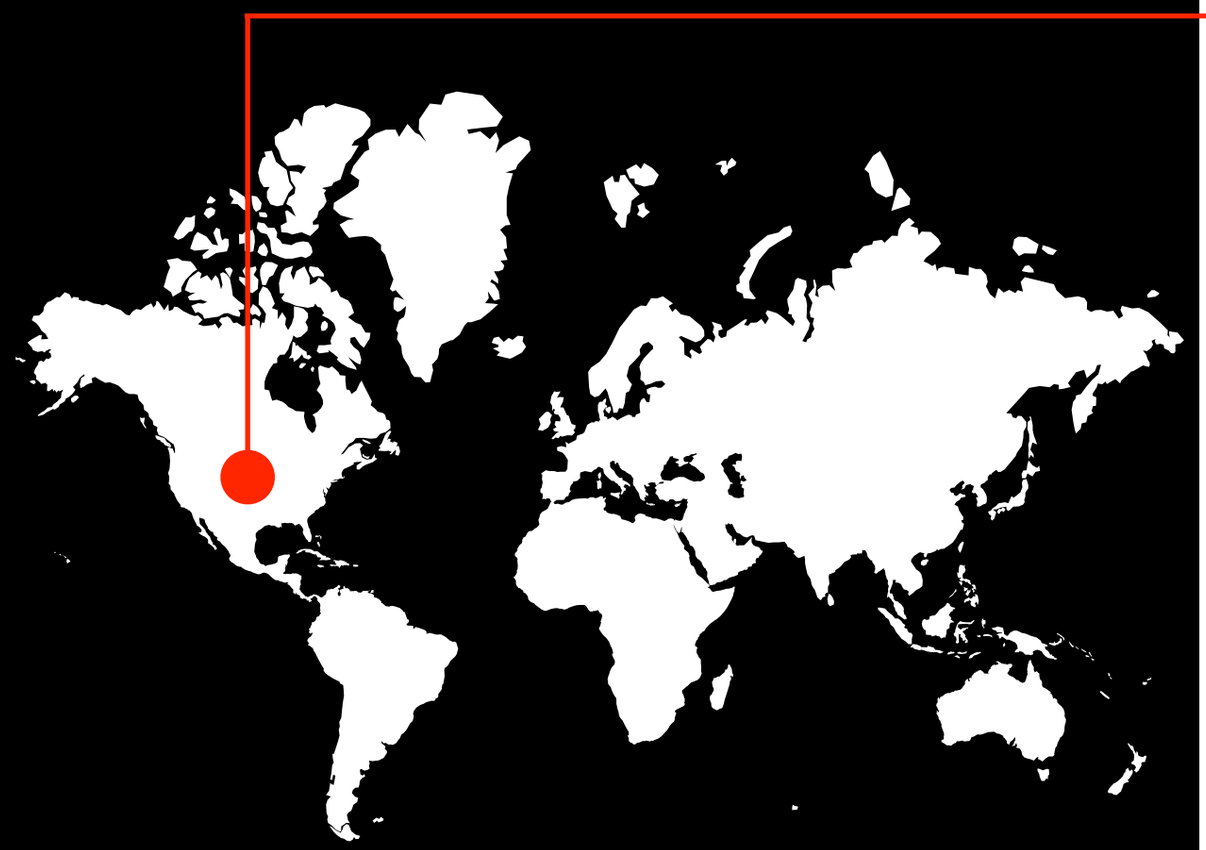
Two main approaches: Proactive and reactive

PROACTIVE

- Used in Australia, Denmark, UK
- Recent examples also from individual US states (NY, ME)
- Recommended payment amounts and legal frameworks for community compensation (recommended by industry associations or governments)
- Developers pay annual fee or fixed per-kWh amount into community benefit fund



Two main approaches: Proactive and reactive

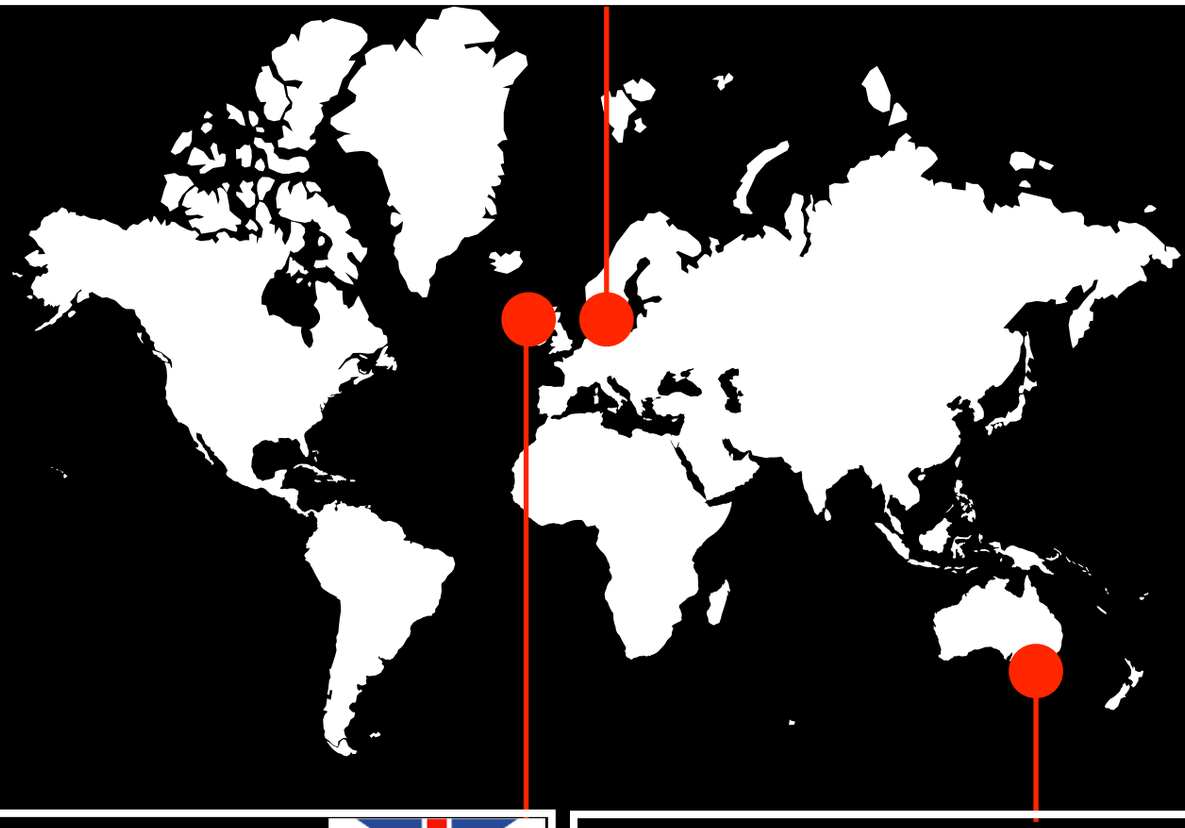


REACTIVE

- Common in the US, Canada
- No prescribed or recommended strategy to reduce wind energy opposition
- Costs involve consulting fees, court fees, administrative costs, payments into wildlife conservation funds

Different types of proactive opposition management

- Long tradition of wind farm co-ownership
- Following increased opposition, 2008 Renewable Energy Act introduced property value loss payments
- One-time upfront payment; amount determined either by external commissions (majority) or voluntary agreements between property owner and developer



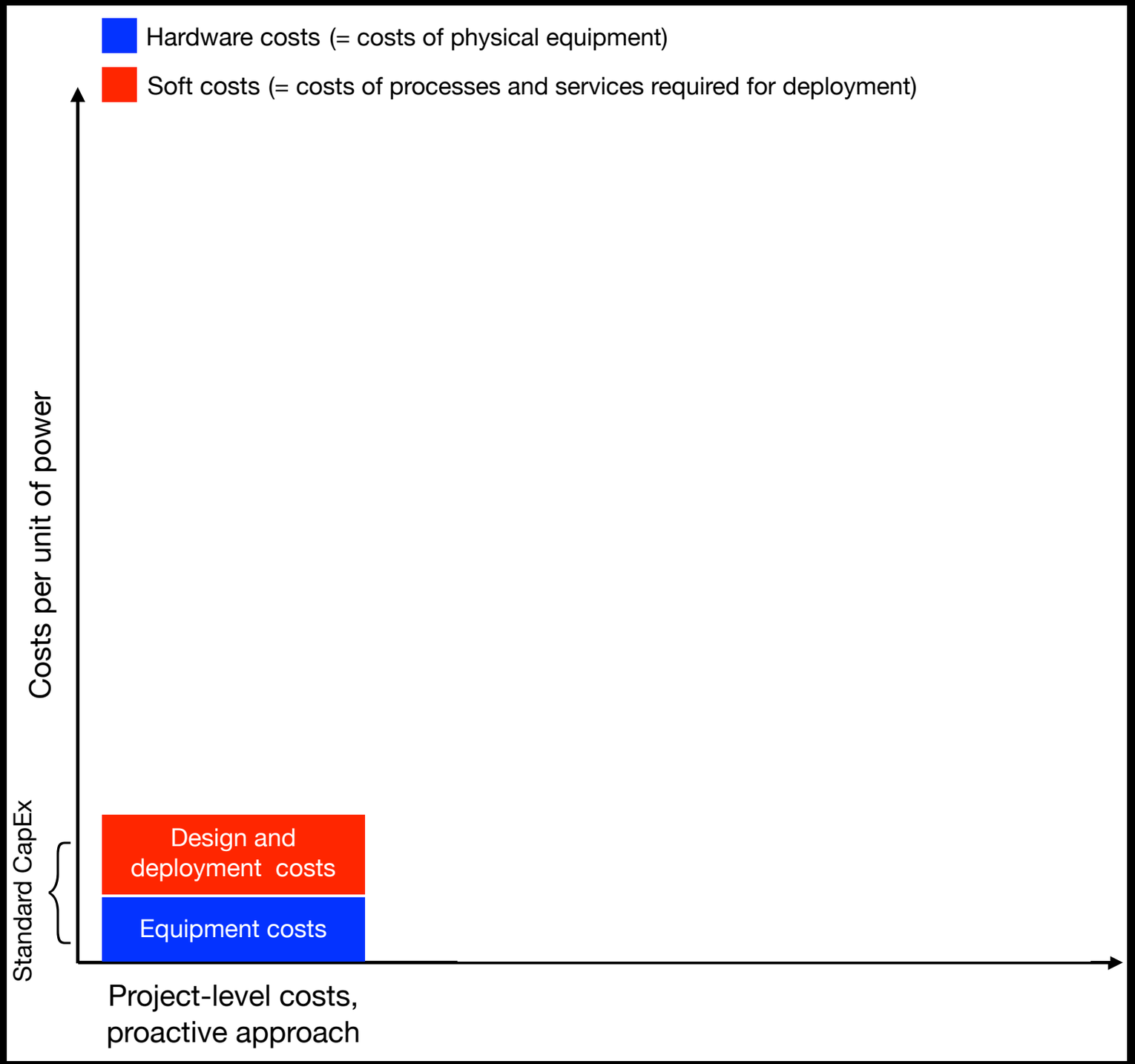
- Community benefit payments since 2000
- Now de-facto standard with government-recommendation for fixed, annual, lifetime per-MW payments since 2009 (£1000)
- Increase to £5000 in 2013

- Voluntary community funds
- Per-MW, per-year payments for entire project lifetime
- No recommended payment amount to enable flexibility and tailored approaches

Research questions

- What approaches have emerged in different wind energy markets to address local opposition to new projects?
- How much do these measures add to upfront investment costs?

Costs associated with proactive and reactive approaches to managing opposition to new energy infrastructure



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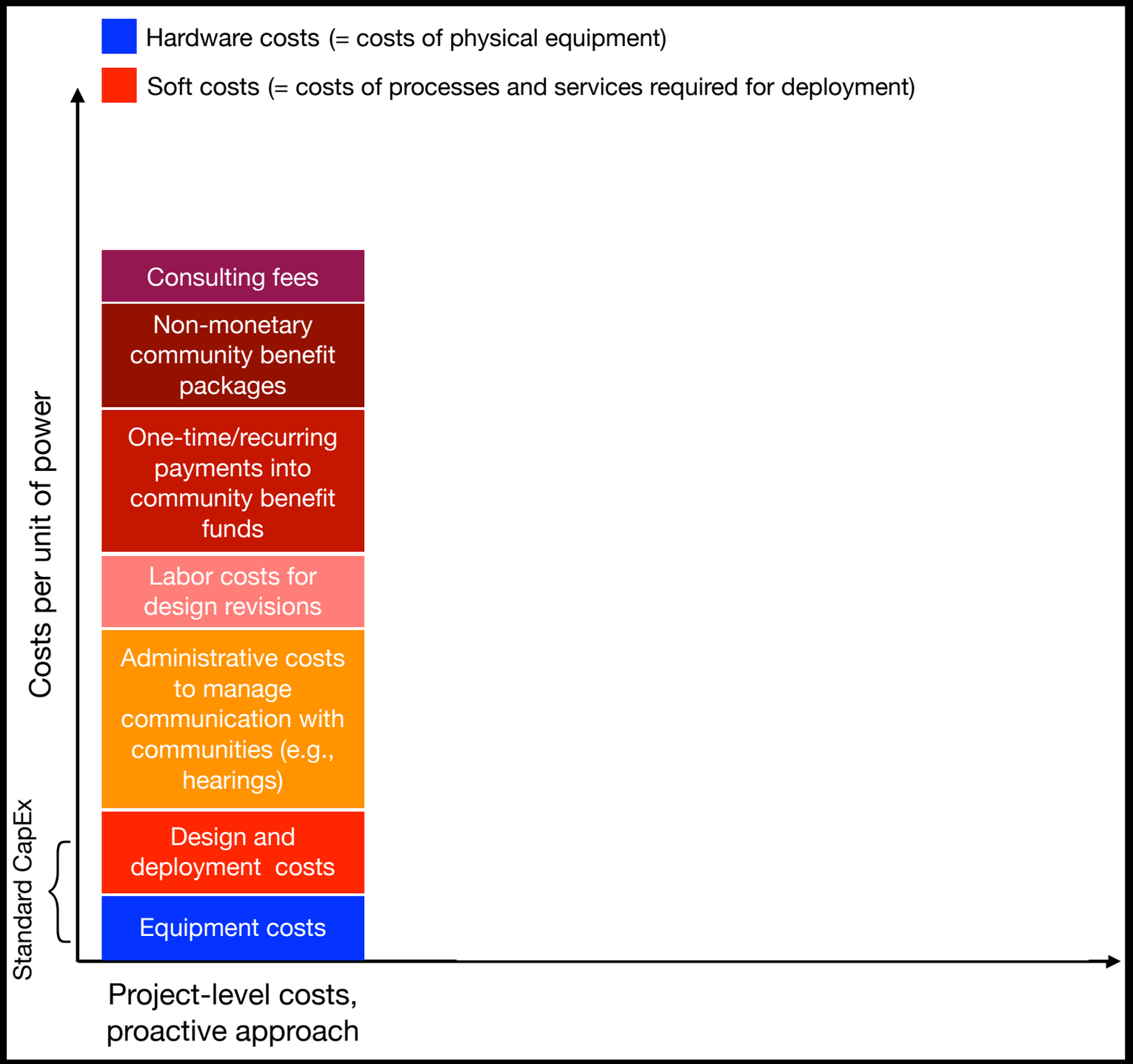

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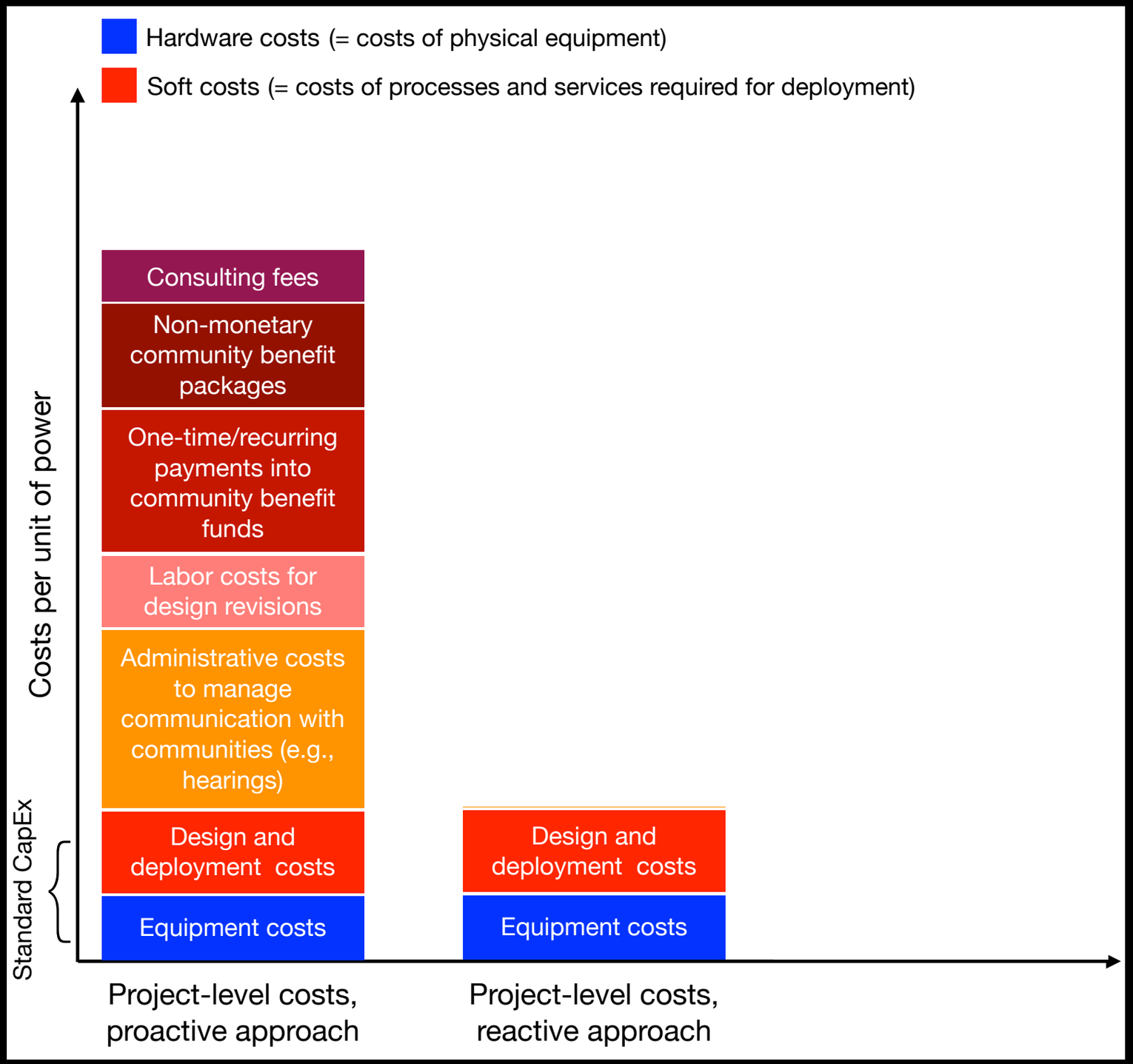

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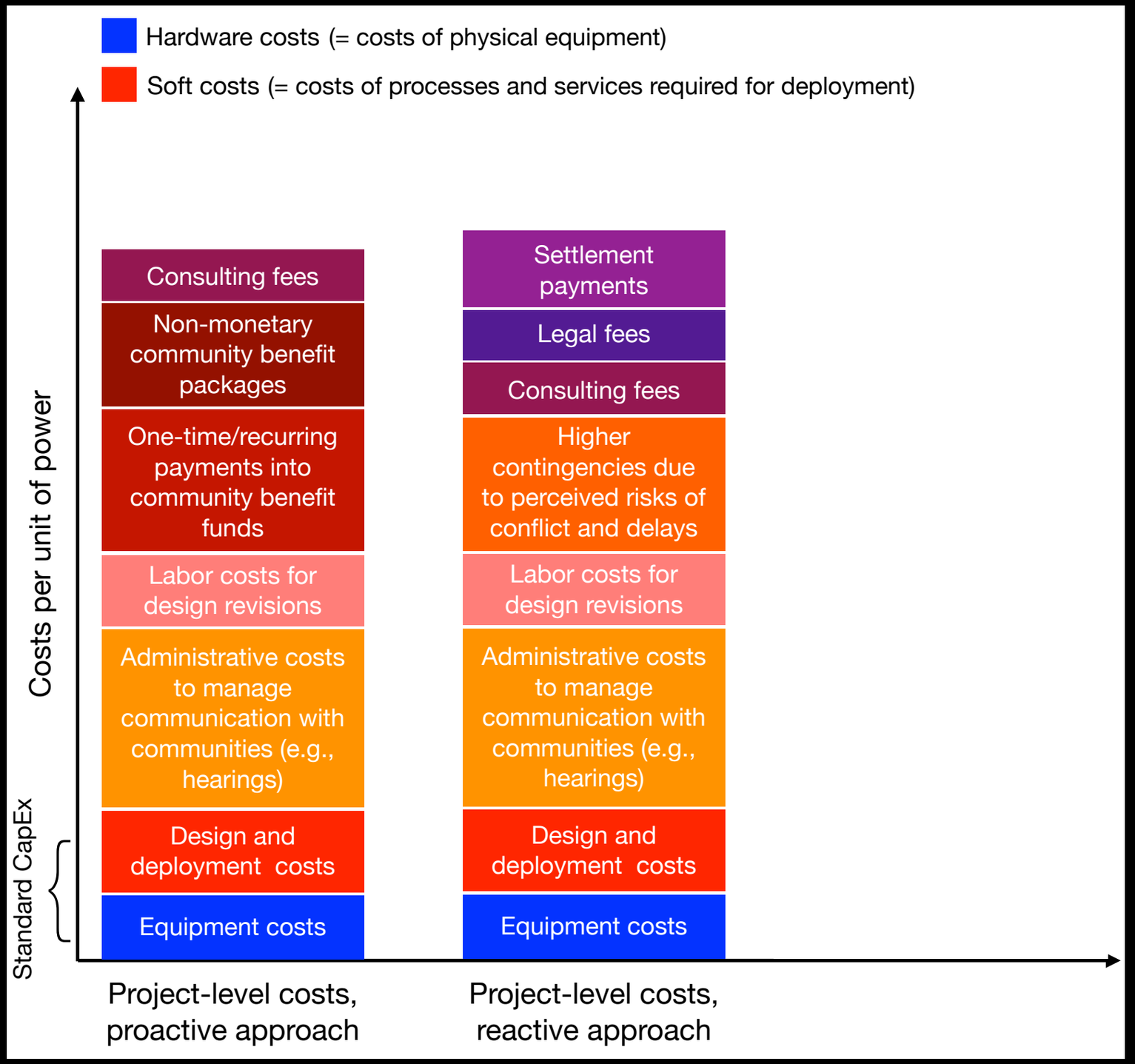

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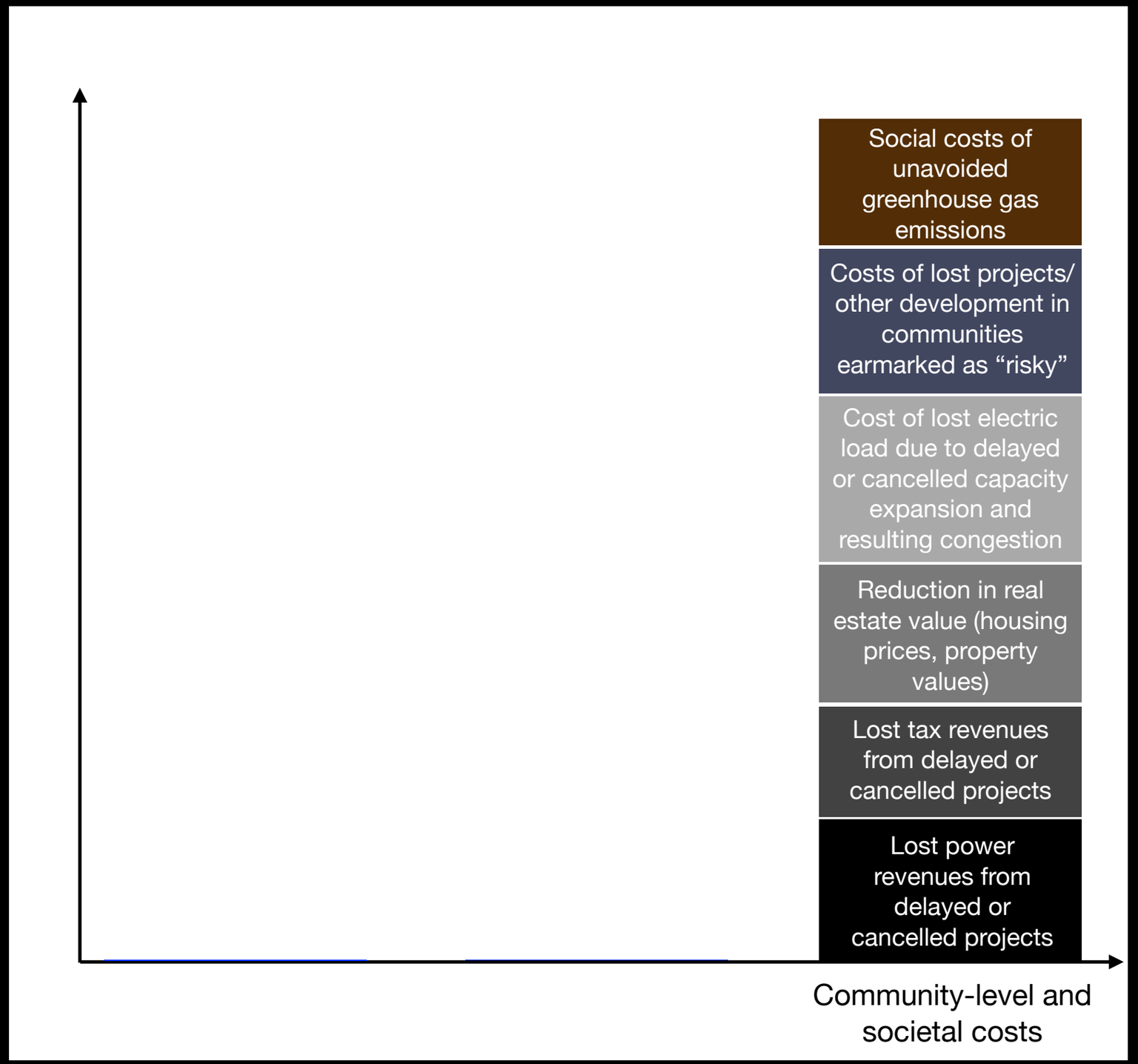
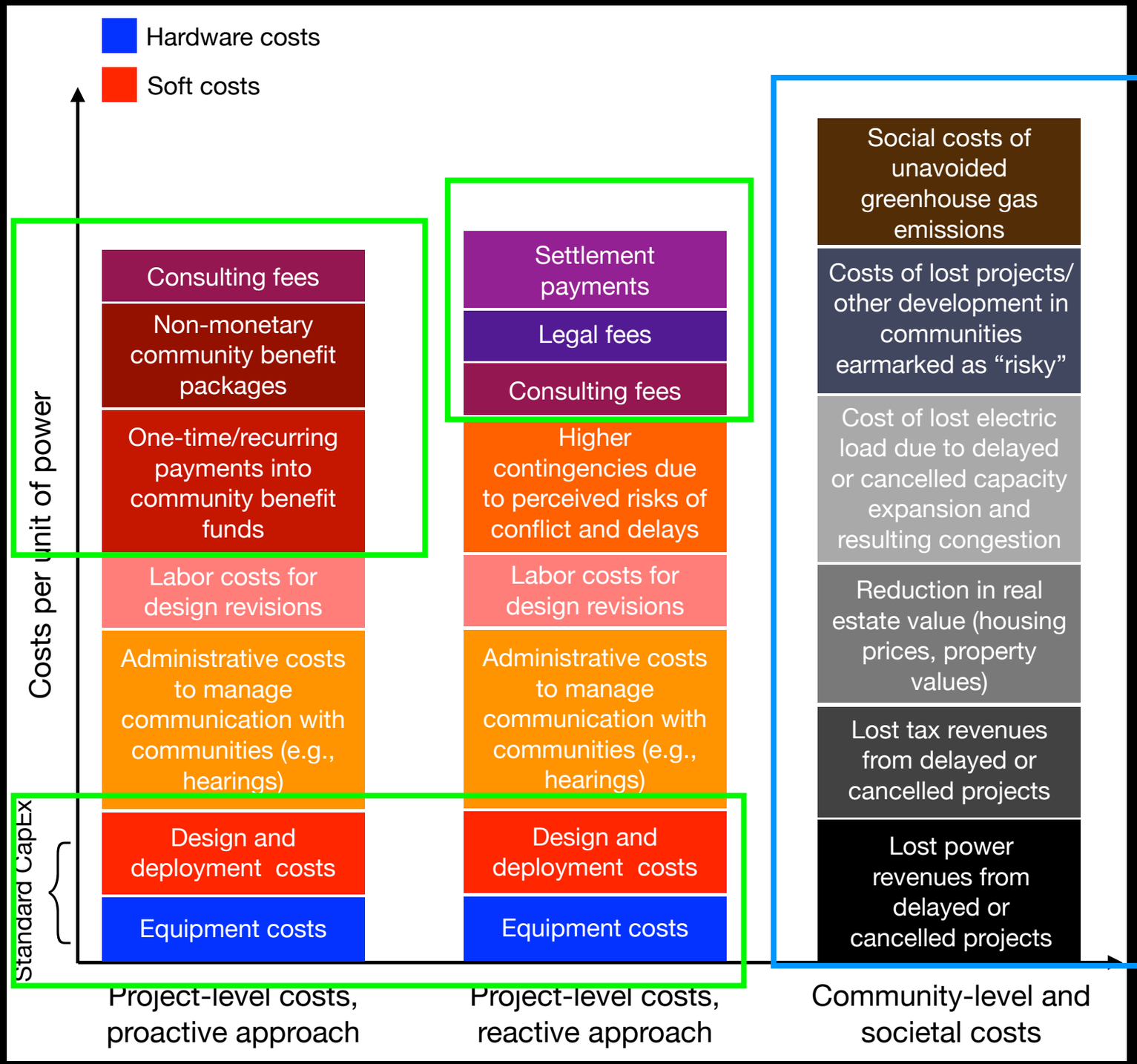


Costs associated with proactive and reactive approaches to managing opposition to new energy infrastructure

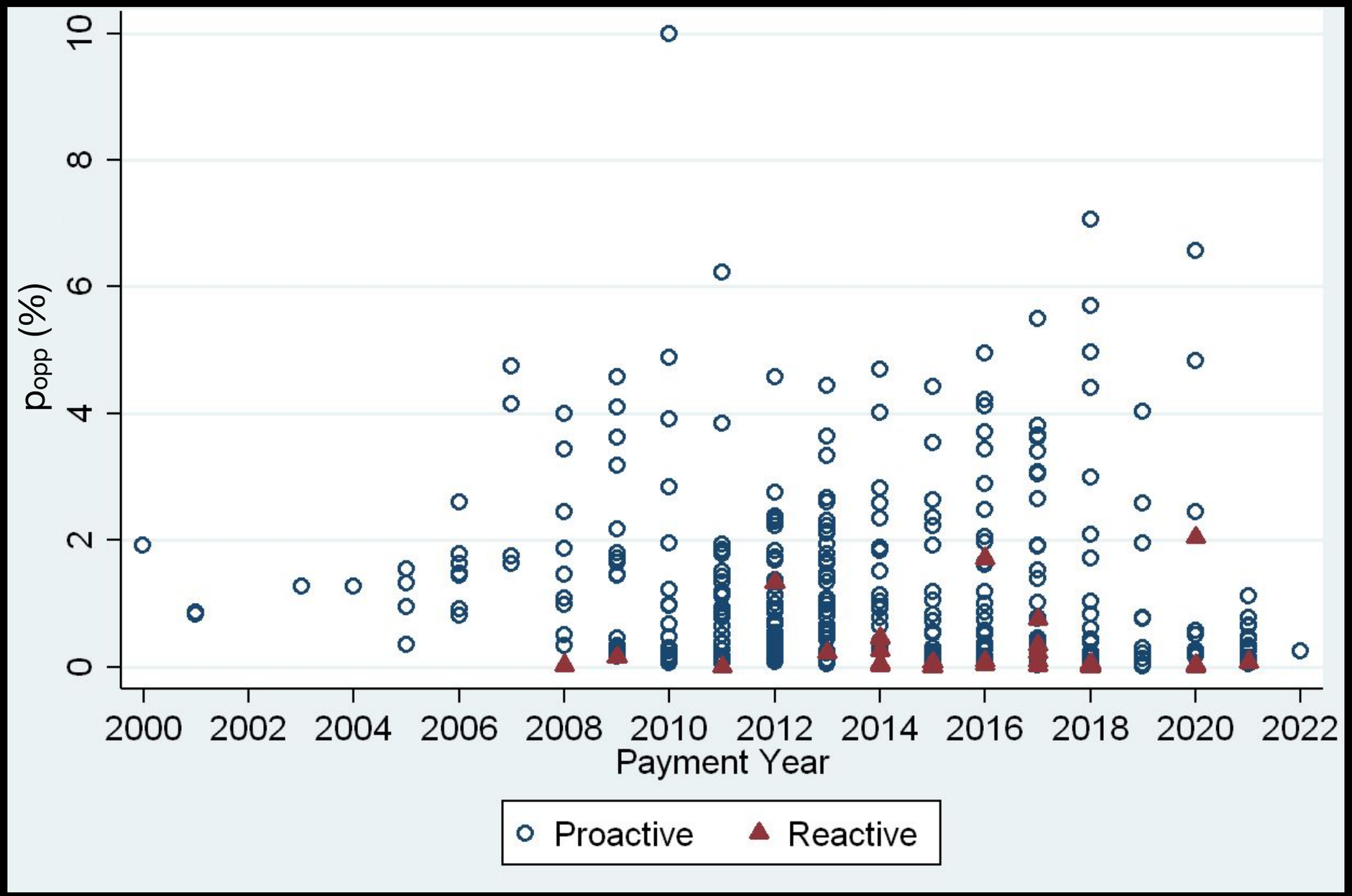
THIS WORK



POTENTIAL FUTURE WORK

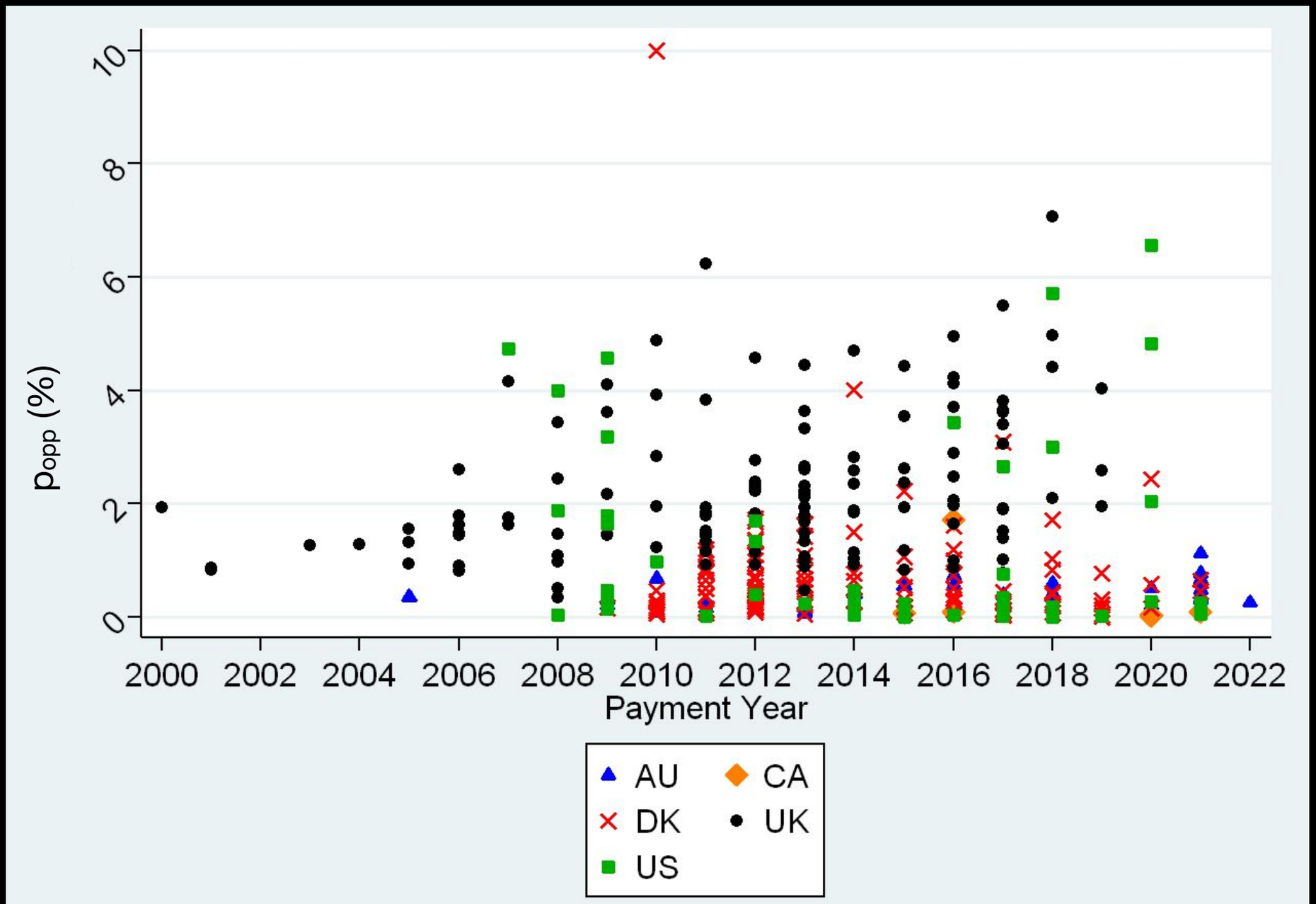
Costs related to opposition add significantly to wind project costs, comparable to other soft costs

DATASET STATUS JULY 2023: 480 PROJECTS



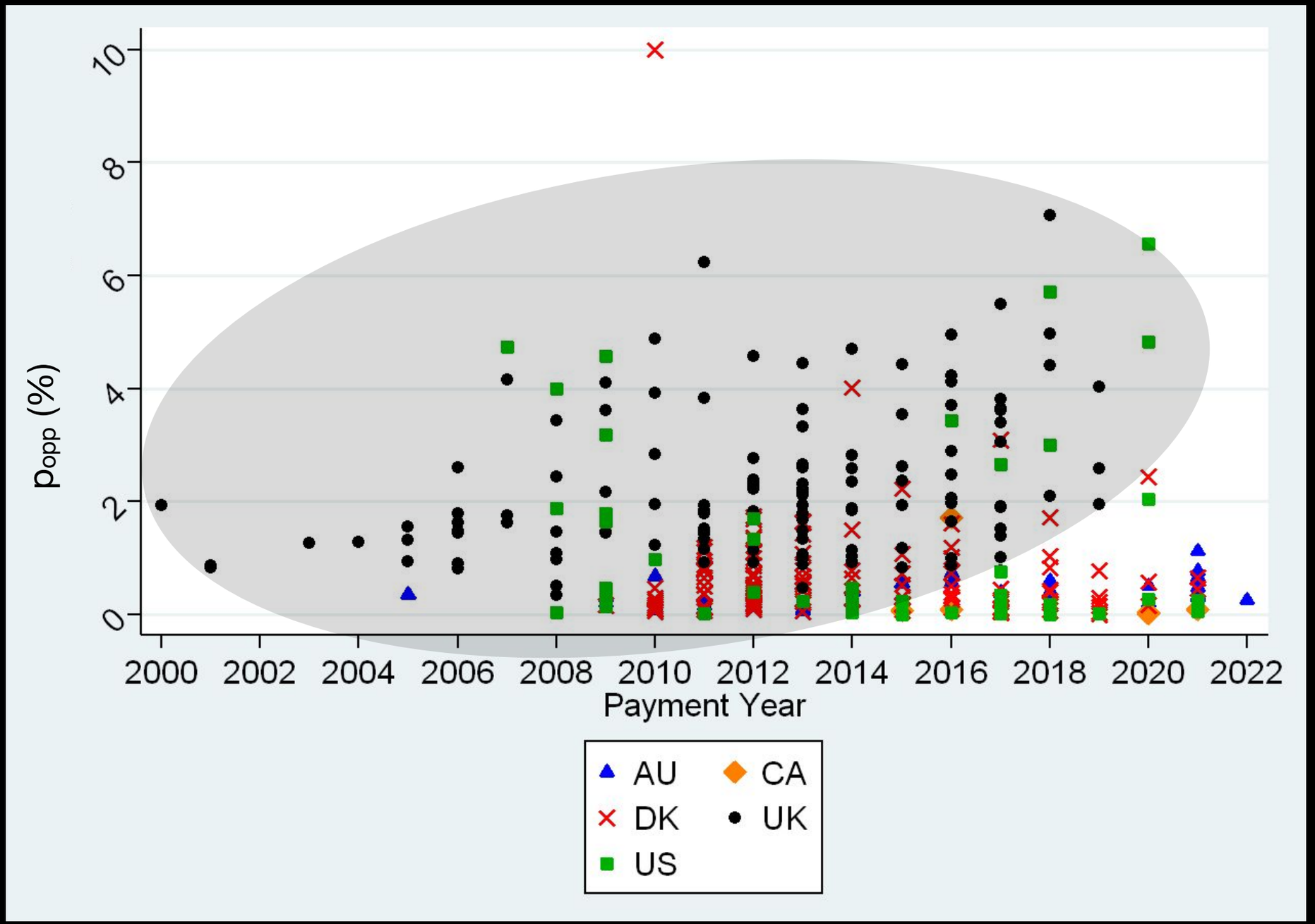
- Costs related to opposition contribute 0.1-10% to total upfront project costs when added to CapEx
- Comparable to other ‘soft’ costs, including engineering management and project development (both 1% of total), assembly and installation (3%)

Opposition-related costs differ across countries



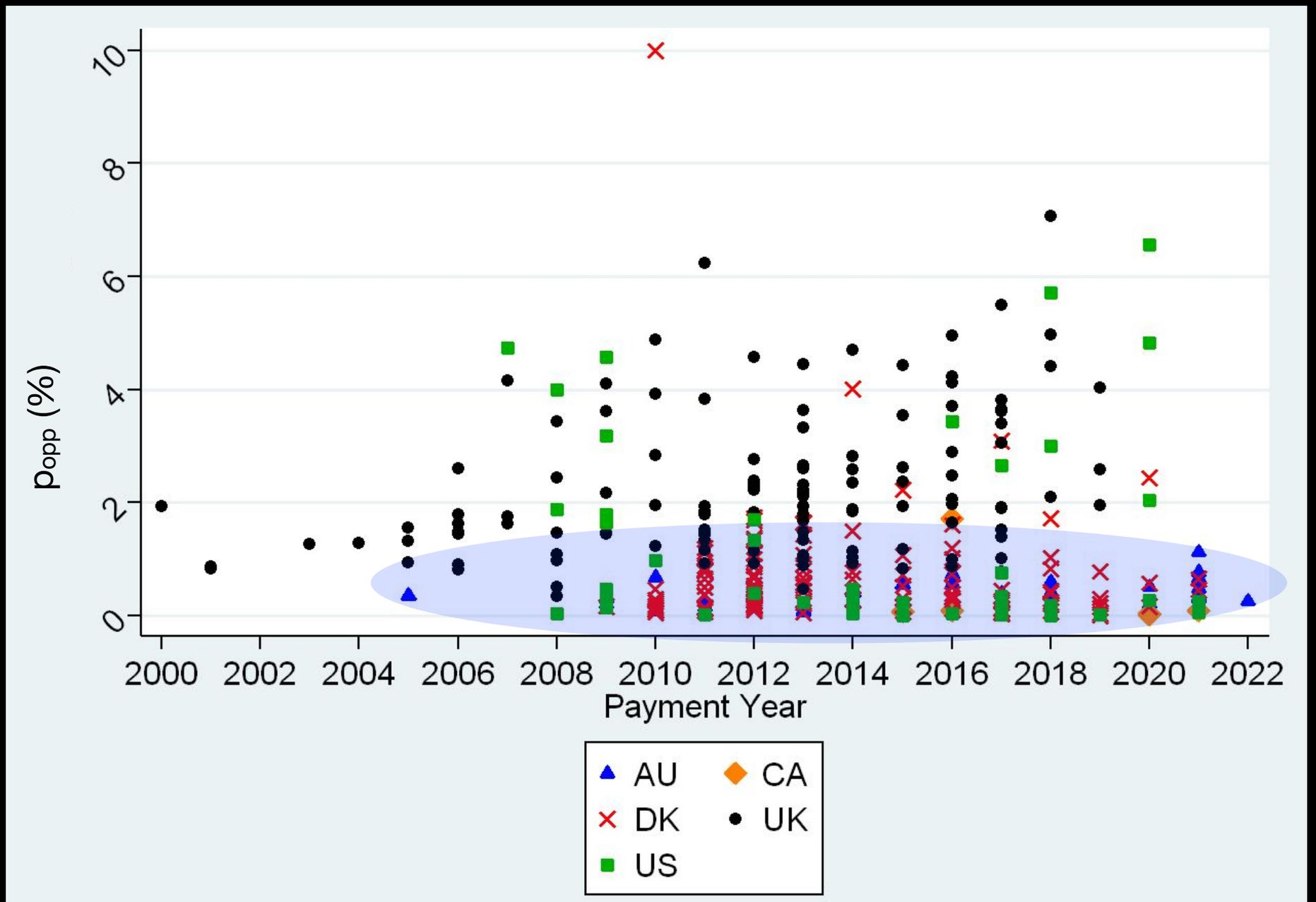
- Country comparison: UK, US consistent higher than Denmark, Australia
- No clear, country-specific temporal trends

Opposition-related costs differ across countries



- Large range (0.1-7.1%) in both UK, US despite very different approaches to opposition management
- UK: All data points represent community benefit payments
- US: Mix of legal fees, community benefit payments, environmental impact compensation payments
- US: Legal fees at the lower end of the range (one-time payments)

Opposition-related costs differ across countries

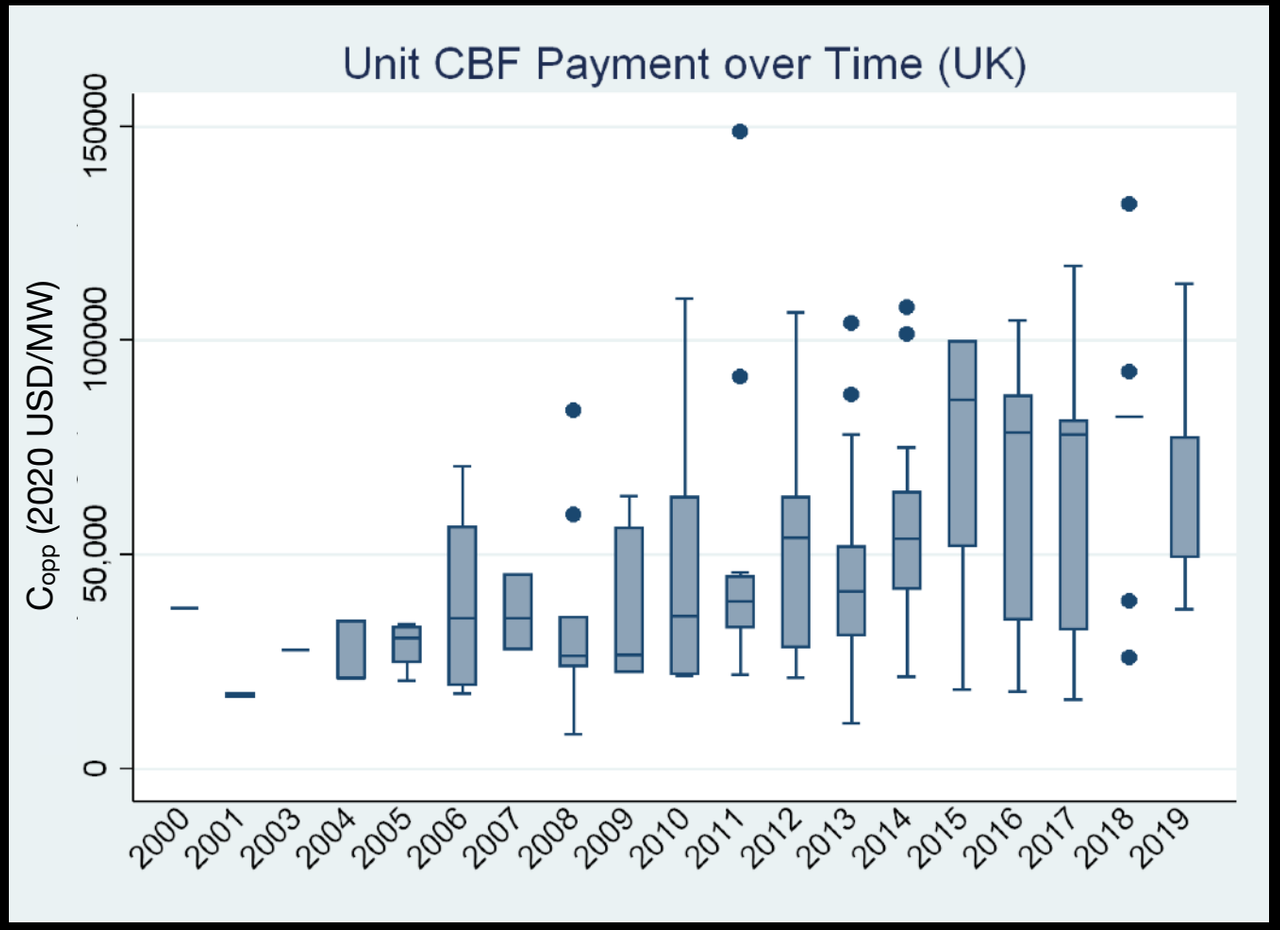


- Smaller range in Australia (0.1%-1.1%)

UK: Proactive approaches do not necessarily make opposition-related costs more predictable

- Variability in payments has increased rather than decreased over time despite more explicit guidance on payment amounts (Plot A)
- Upwards trend in C_{opp} in contrast to downwards trend in CapEx

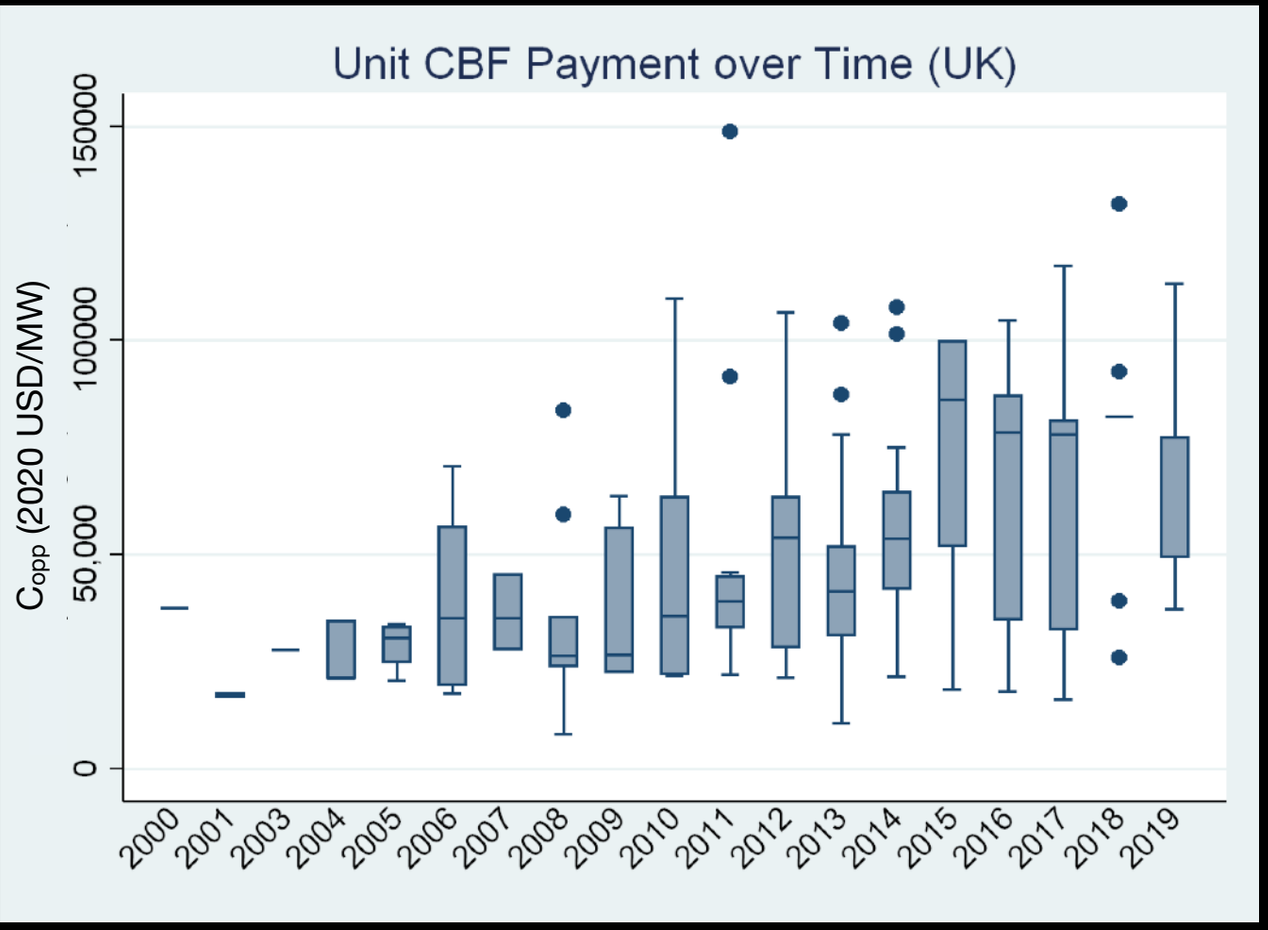
A



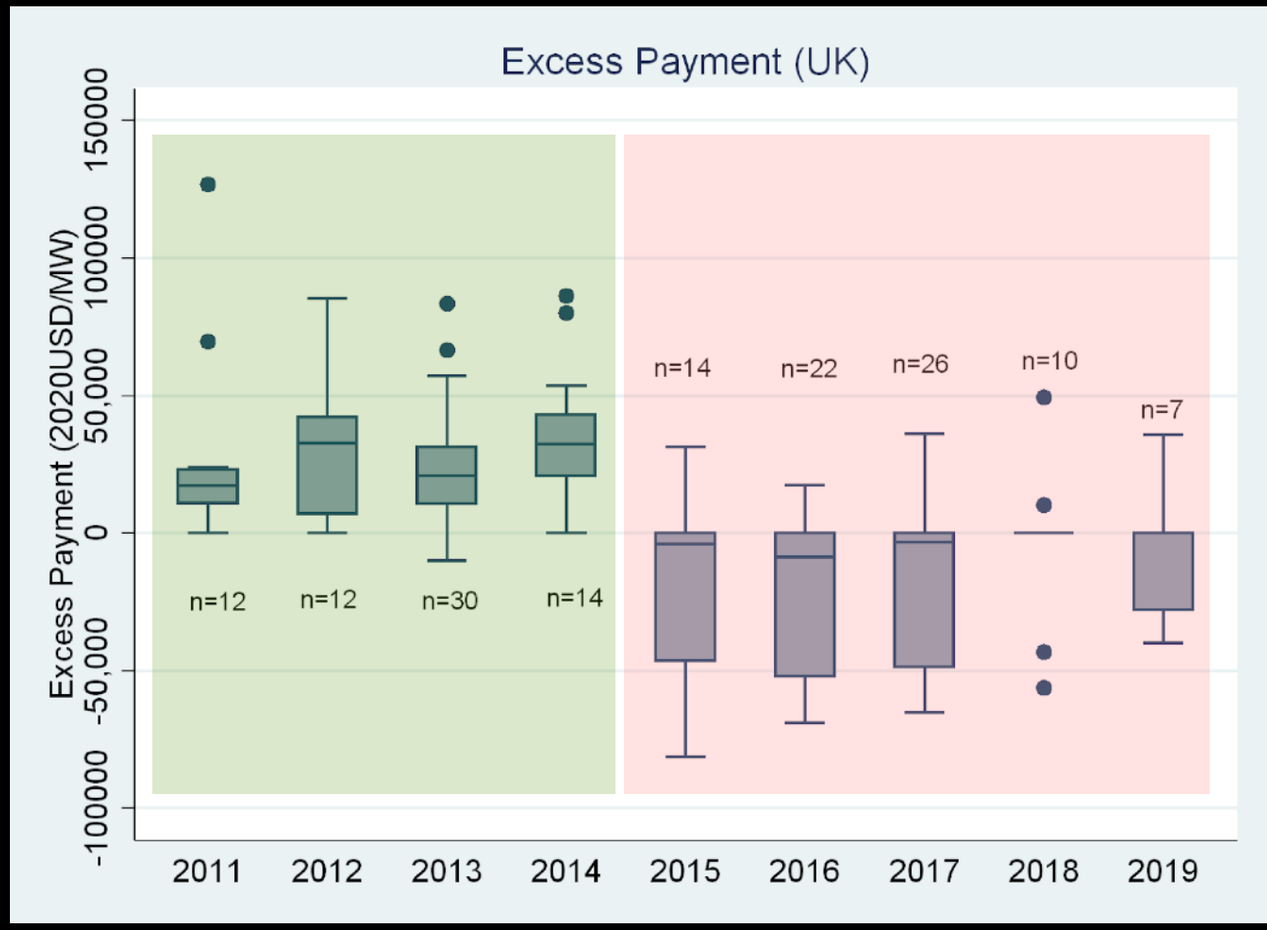
UK: Proactive approaches do not necessarily make opposition-related costs more predictable

- Variability in payments has increased rather than decreased over time despite more explicit guidance on payment amounts (Plot A)
- Upwards trend in C_{opp} in contrast to downwards trend in CapEx
- Developers were willing to overpay (excess payment > 0, green), now tend to underpay (red) after the recommended payment was increased 5-fold (Plot B)

A



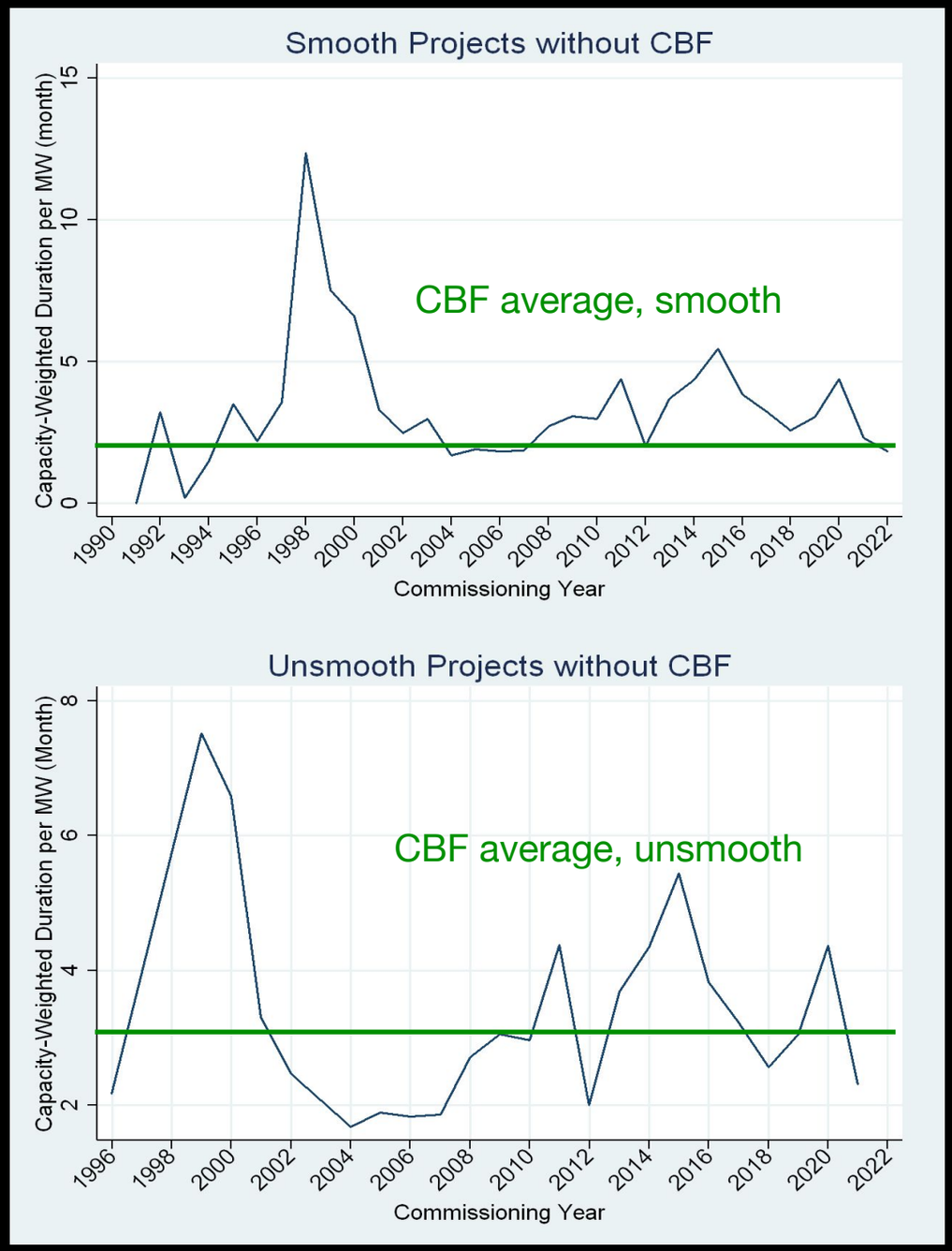
B



However, community benefit fund payments reduce pre-commissioning period (in the UK)

- Projects *with* community benefit fund are shorter on average in terms of pre-commissioning time (from planning application submission to commissioning) in most years during 2000-2019
- This holds regardless of whether these are “smooth” or “unsmooth” projects

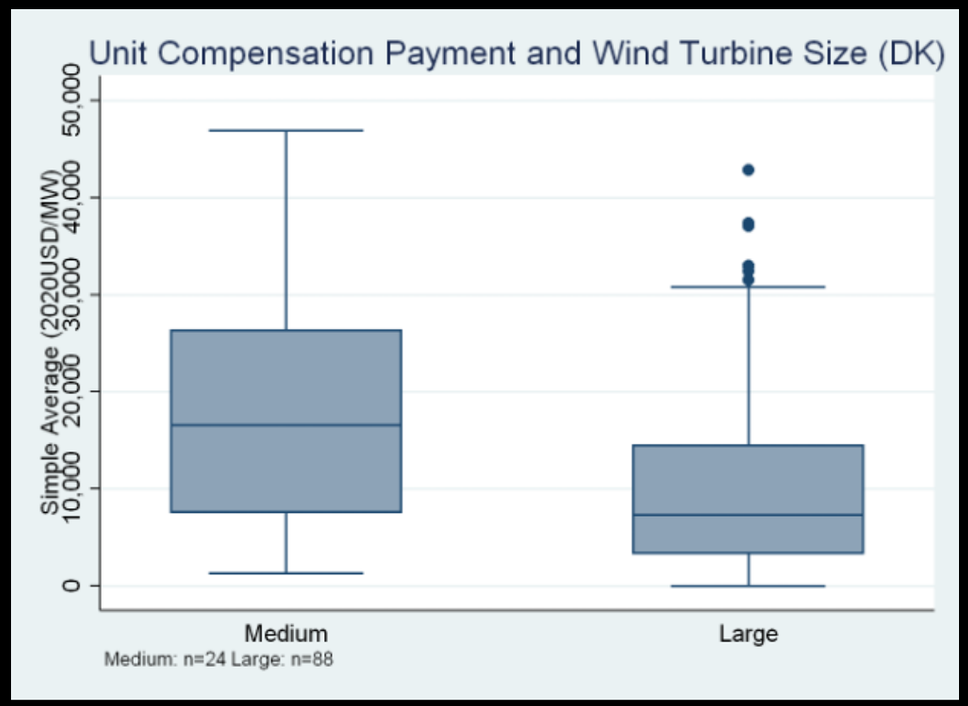
Smooth= no permit application refused or appealed

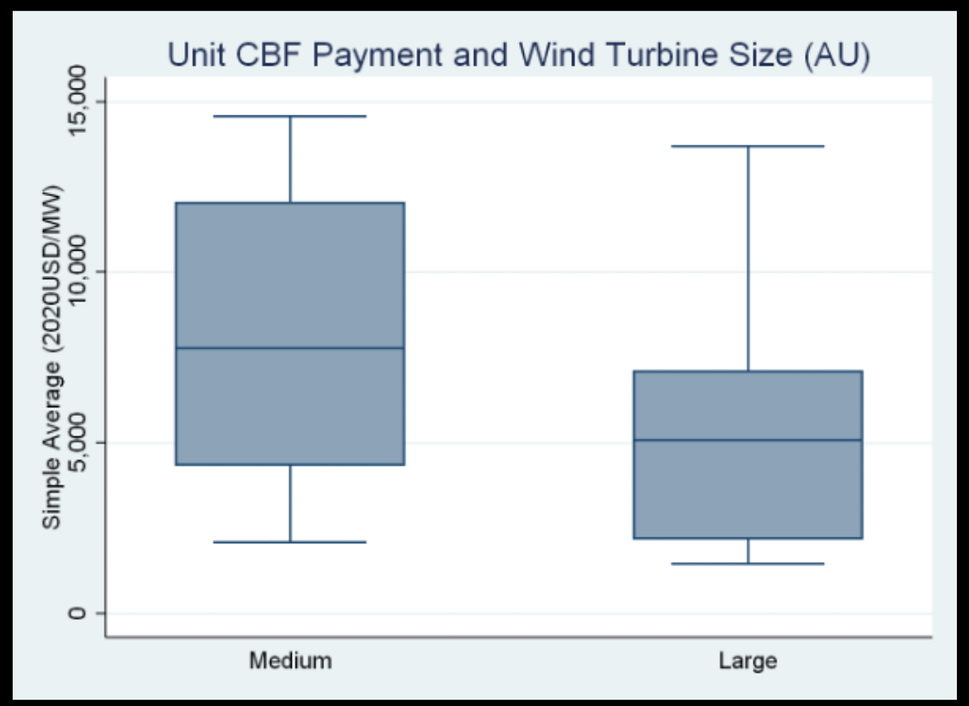


Unsmooth= permit application refused or appealed

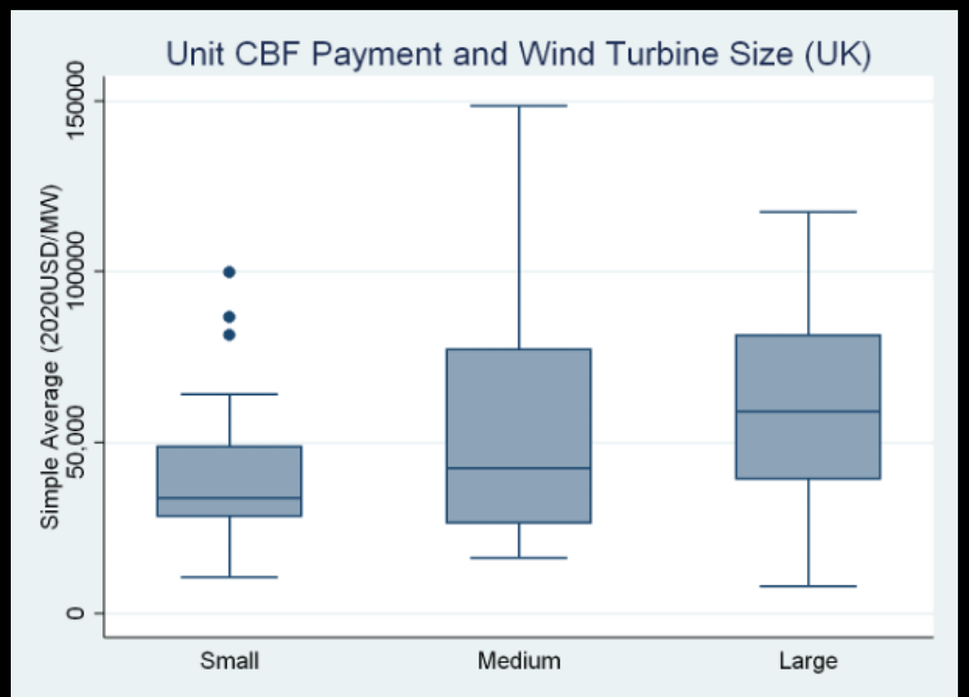
Drivers of opposition costs: Some evidence for lower opposition cost share in larger wind farms

- Lower per-MW opposition costs for larger wind farms in Denmark, Australia, but not in the UK
- No relationship between opposition costs and wind farm density, population density, income level





UK: No effect because increasing wind farm size over time, AND increasing recommended payment



Conclusions

- Costs associated with local opposition to wind projects are similar in magnitude to other, more frequently discussed soft costs

- Large and persistent variability in opposition-related costs across projects, even in countries actively trying to manage the problem (e.g.,UK)
    - Proactive approaches don’t make opposition costs more predictable

Conclusions

- Costs associated with local opposition to wind projects are similar in magnitude to other, more frequently discussed soft costs

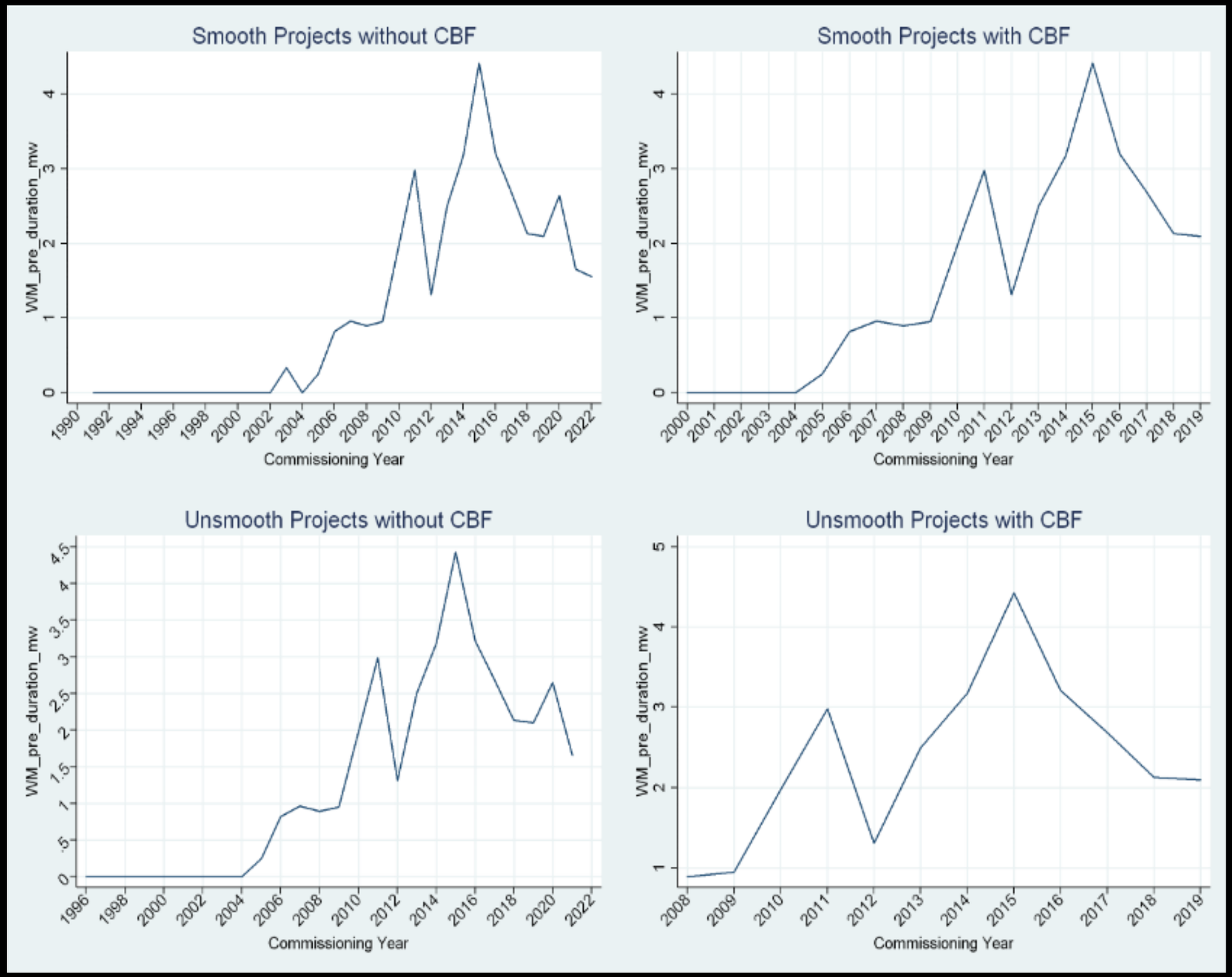
- Large and persistent variability in opposition-related costs across projects, even in countries actively trying to manage the problem (e.g.,UK)
    - Proactive approaches don’t make opposition costs more predictable

- Size of opposition-related payments is difficult to explain
    - Some evidence for cost-reducing effects of wind farm and turbine sizes
    - No relationship found for population density, wind farm density, income level

- Reactive approaches do not appear to be more costly (based on what is currently measurable), but may be more risky
    - Community benefit funds reduce pre-commissioning time in the UK
    - Next step: Examine other effects of reactive vs. proactive approaches, e.g., differences in wind farm cancellation rates

No apparent effect, however, on planning period

WM = Years from application to commissioning?



Smooth= no application rejection

Unsmooth= application rejection